

## Claims

- [c1] 1. A packaged device comprising:  
a substrate having conductive traces;  
a die having contacts formed on a major surface of the die, the die being placed so that the contacts electrically contact the conductive traces of the substrate;  
a dam surrounding the die; and  
an underfill filling of a gap between the die and the substrate, wherein the dam confines and shapes an edge of the underfill.
- [c2] 2. The device of claim 1, wherein the underfill has a wetting angle at the die that is less than  $45^\circ$ .
- [c3] 3. The device of claim 1, wherein the underfill has a wetting angle at the dam that is less than  $45^\circ$ .
- [c4] 4. The device of claim 1, further comprising a ball grid array on a side of the substrate opposite to the die, the ball grid array having a pitch that is less than or about equal to one half a separation between the dam and an edge of the die.
- [c5] 5. The device of claim 4, wherein the dam has a width that is between one and two times the pitch of the ball grid array.
- [c6] 6. The device of claim 1, wherein the dam comprises a structure attached to the substrate.
- [c7] 7. The device of claim 1, wherein the die resides inside a depression in the substrate, and the dam comprises a portion of the substrate surrounding the depression.
- [c8] 8. The device of claim 1, wherein the dam comprises a treated region of the substrate over which a bead of the underfill resides, the underfill when liquid having a high affinity for the treated region so that the treated region confines and shapes the edge of the underfill.
- [c9] 9. A method for packaging an integrated circuit die, comprising:

attaching the die to a substrate so that conductive traces on the substrate electrically contact contacts on the die;  
forming a dam on the substrate; and  
filling a volume between the die and the substrate and between the die and the dam with an underfill material.

- [c10] 10. The method of claim 9, wherein forming the dam comprises:  
depositing a flexible material on the substrate; and  
curing the flexible material to form the dam.
- [c11] 11. The method of claim 9, wherein forming the dam comprises:  
preforming the dam; and  
attaching the preformed dam to the substrate.
- [c12] 12. The method of claim 9, wherein forming the dam comprises treating a region of the substrate so that the treated region has a high affinity to the underfill material, the treated region limiting flow of the underfill material during the filling.
- [c13] 13. The method of claim 9, wherein:  
forming the dam comprises removing a portion of the substrate to form in the substrate a depression with the dam as a wall surrounding the depression; and  
wherein  
attaching the die attaches the die in the depression.
- [c14] 14. The method of claim 9, wherein filling the volume comprises applying a liquid underfill material into the volume until the underfill material has a wetting angle at the die that is less than  $45^\circ$ .
- [c15] 15. The device of claim 9, wherein filling the volume comprises applying a liquid underfill material into the volume until the underfill has a wetting angle at the dam that is less than  $45^\circ$ .
- [c16] 16. The device of claim 9, wherein forming the dam comprises positioning the dam away from an edge of the die by a separation greater than about twice a pitch of a ball grid array on the substrate.

[c17]

17. The device of claim 9, wherein forming the dam comprises providing the dam with a width that is between one and two times a pitch of a ball grid array on the substrate.

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